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YEUNG AND YEO: VIDEO VISUALIZATION

nance generally capture well the relative importance of video contents in a wide variety of video materials.⁴

In conclusion, from the analysis, characterization, and modeling of video, we can build intuitive and meaningful representations of video. Together they contribute to semantic visualization of video and succinct presentation of the pictorial content, as well as provide the tools for many applications in digital video, including nonlinear video access, efficient storage and retrieval, effective query, browsing and navigation, competition, data management, and organization. These tools are the enabling technologies for new applications and services of digital video.

ACKNOWLEDGMENT

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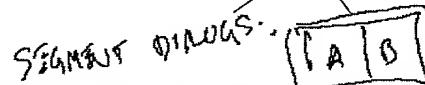
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⁴Capturing "true" semantic significance in video automatically is a difficult problem that warrants further research.

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Fig. 1

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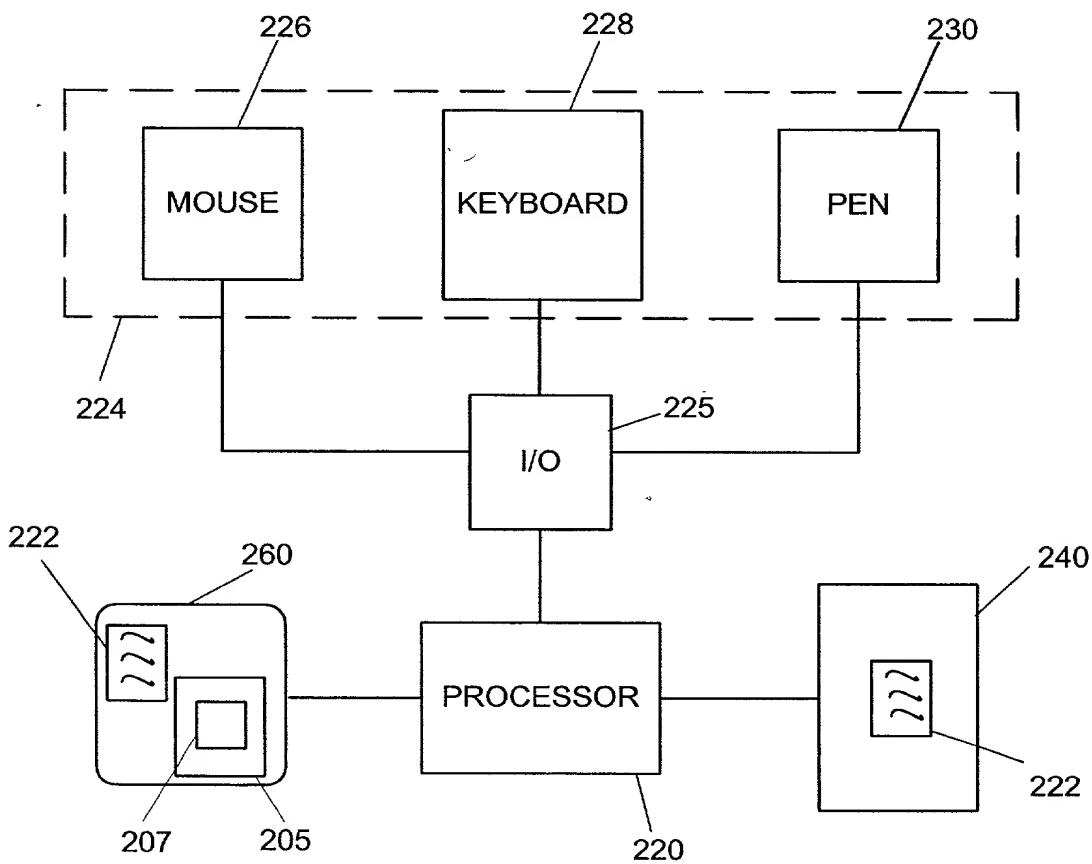


FIG. 2

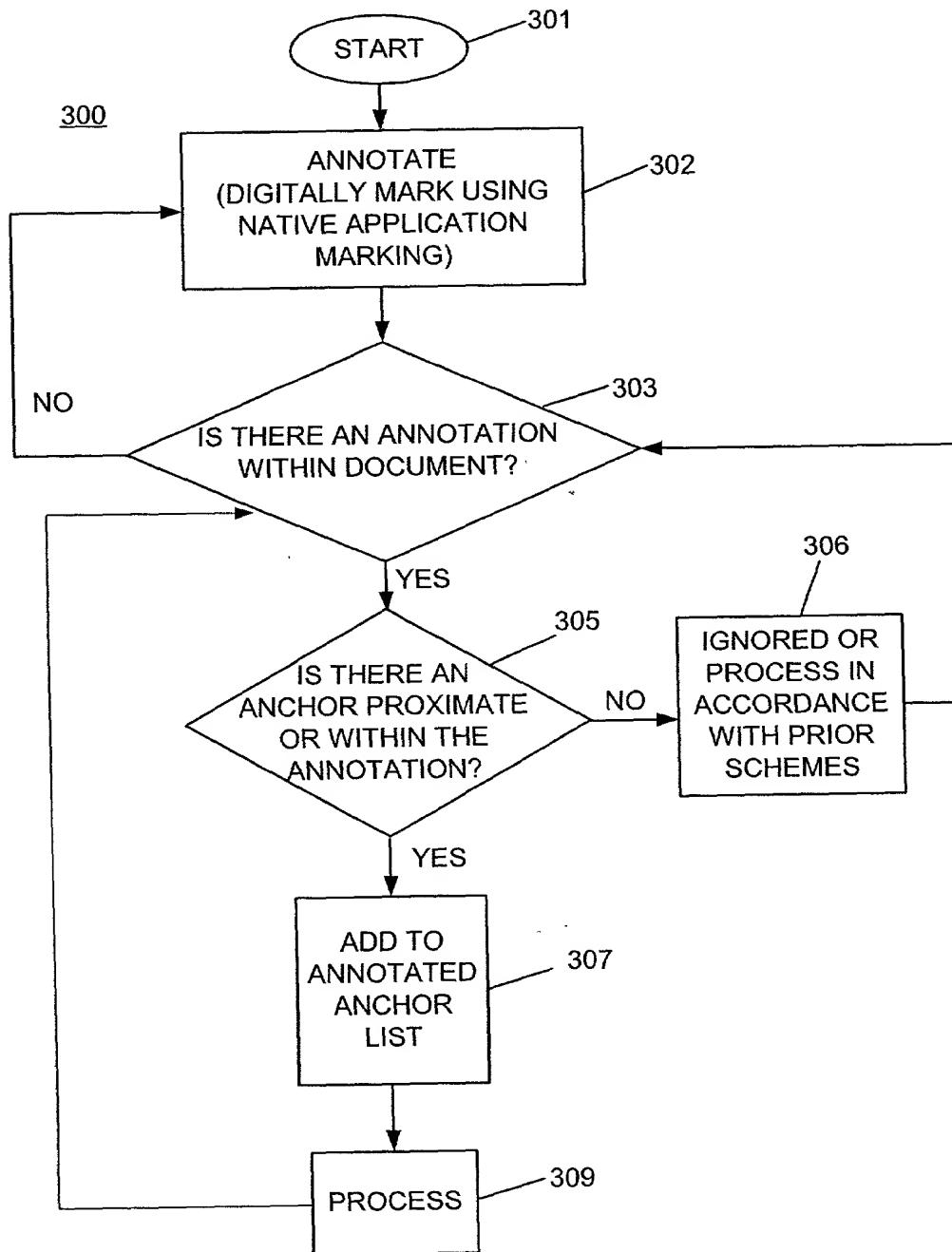


FIG. 3

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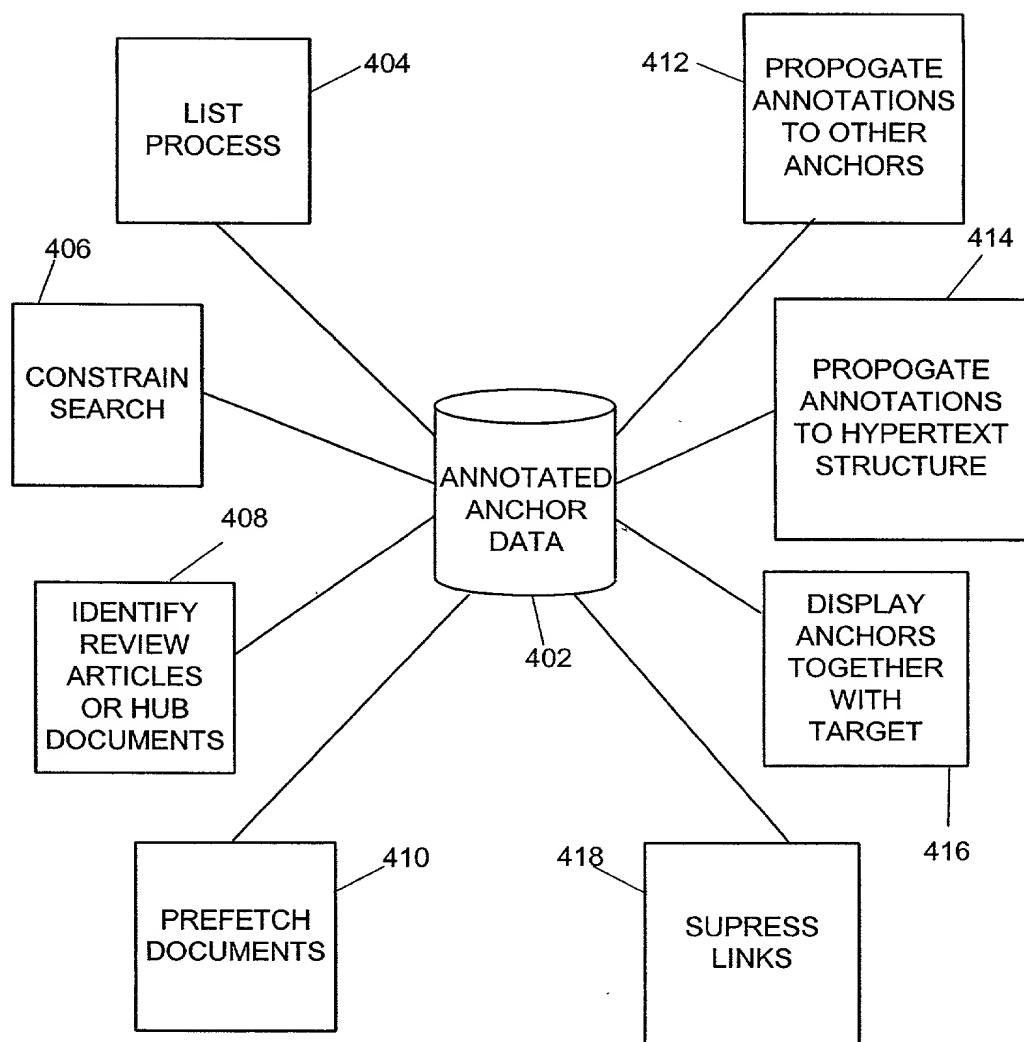


FIG. 4

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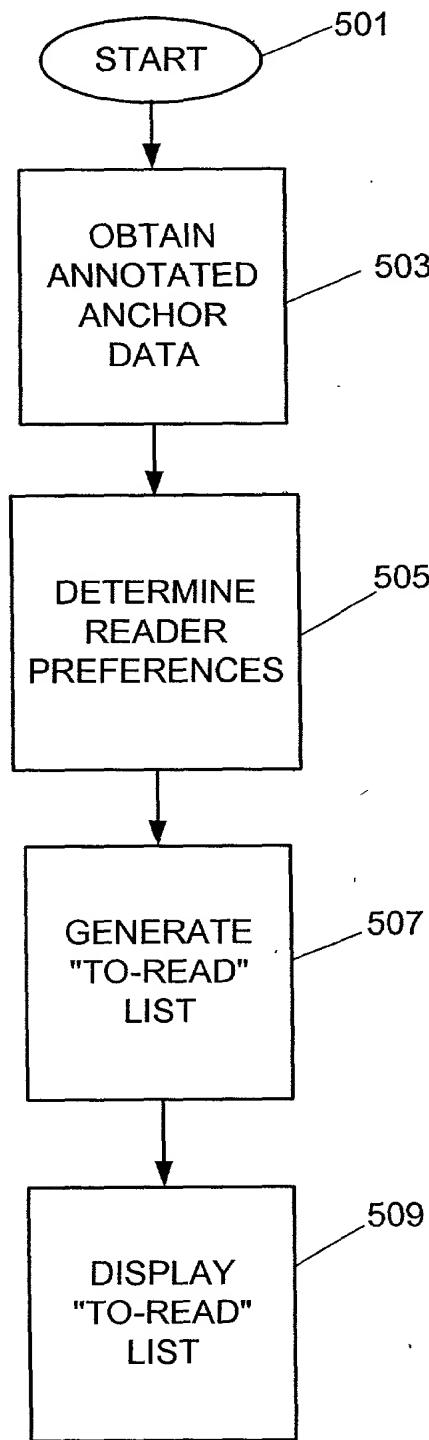


FIG. 5

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Cited in Yeung et al., 1998:

Falchuk and Karmouch 1995

on p.2

motion detected in the given shot. Falchuk and Karmouch [9] propose the concept of video-tiles in which the key frame of

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on p.14

[9] B. Falchuk and K. Karmouch, "A multimedia news delivery system over an ATM network," in *Int. Conf. Multimedia Computing and Systems*, 1995, pp. 56-63.

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on p.11

http://www.ibm.com.sfasp/

under the theme "Solutions for a small planet." A different way of presentation was adopted in the original web site <http://www.ibm.com.sfasp/>, where a thumbnail image is displayed to represent each commercial. Fig. 9(b) shows

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Yeung and Yeo 1996

on p.15

[15] M. M. Yeung and B. L. Yeo, "Time-constrained clustering for segmentation of video into story units," in *Int. Conf. Pattern Recognition (ICPR'96)*, Aug. 1996, vol. C, pp. 375-380.

607

Yeung and Lin 1995

on p.15

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Fig 6A

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Vernonia v. Acton
Sup. Ct., June 1995

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Fig 6B

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Cited in Chandler v. Miller:

In contrast to the effective testing regimes upheld in Skinner, Von Raab, and Vernonia, Georgia's certification requirement is not well designed to identify candidates who violate antidrug laws and is not a credible means to deter illicit drug users from seeking state office.

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Cited in Todd v. Rush:

The outcome of this case is governed by Vernonia School District 473 v. Acton, 515 U.S. 646, and Schall v. Tippecanoe County School, 864 F.2d 1309 (7th Cir. 1988). Those cases upheld random urinalysis requirements for students who participate in interscholastic athletics.

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Skinner v. Railway Labor Executives' Assn.
Sup. Ct, March 1989

Cited in von Raab:

Marshall, J., joined by Brennan, J., dissenting, expressed the view that (1) in the case at hand, as in Skinner v Railway Labor Executives' Assn., 489 US 602, the court's abandonment of the Fourth Amendment's express requirement that searches of the person rest on probable cause was unprincipled and unjustifiable;

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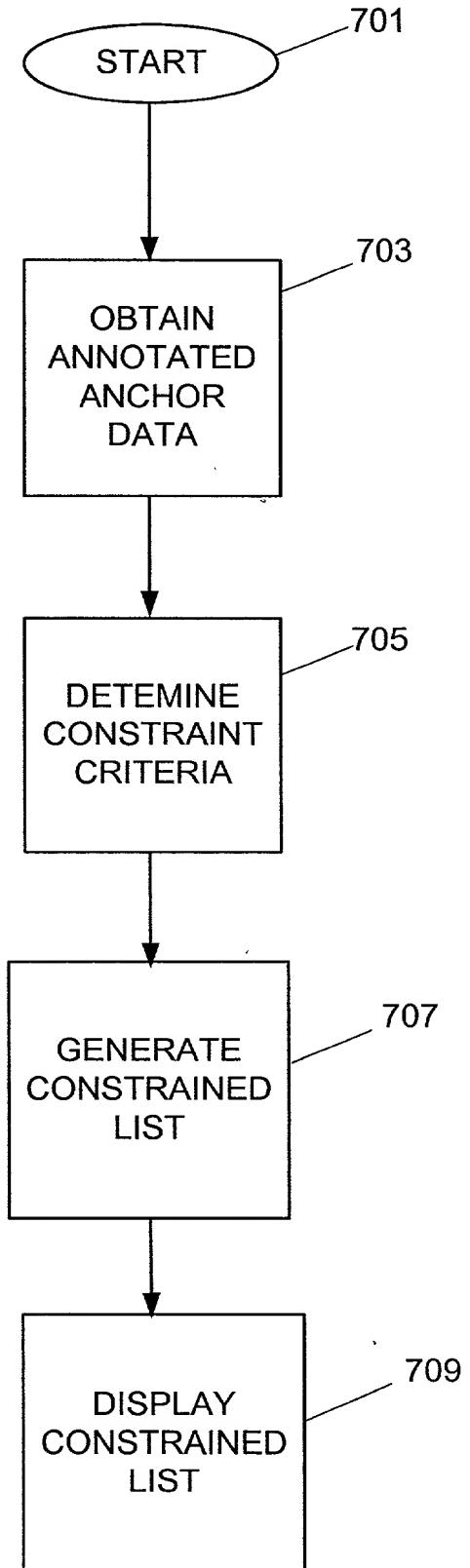


FIG. 7

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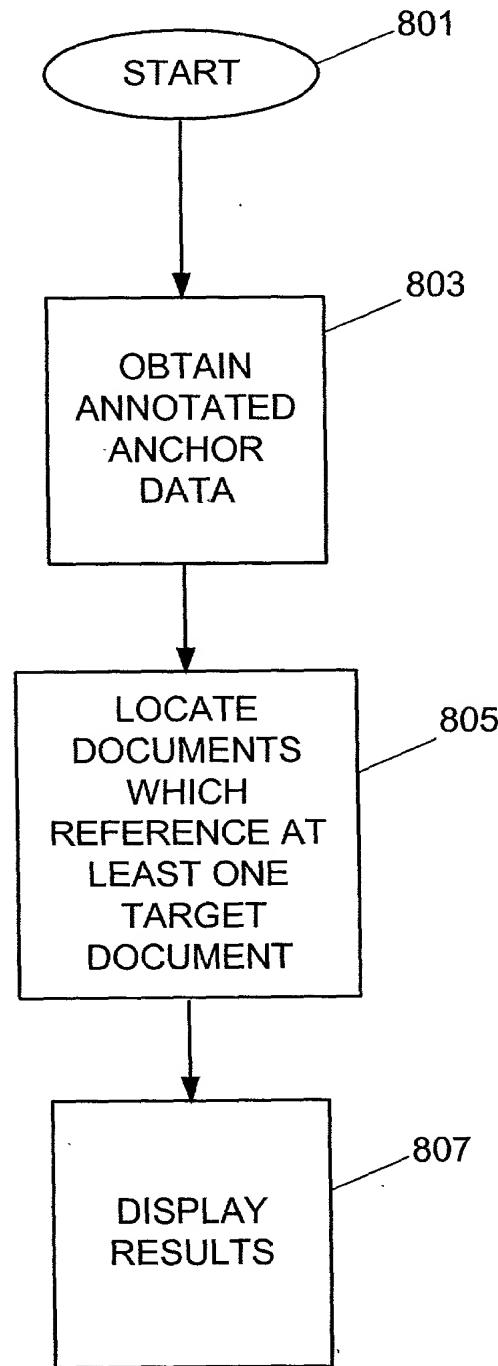


FIG. 8

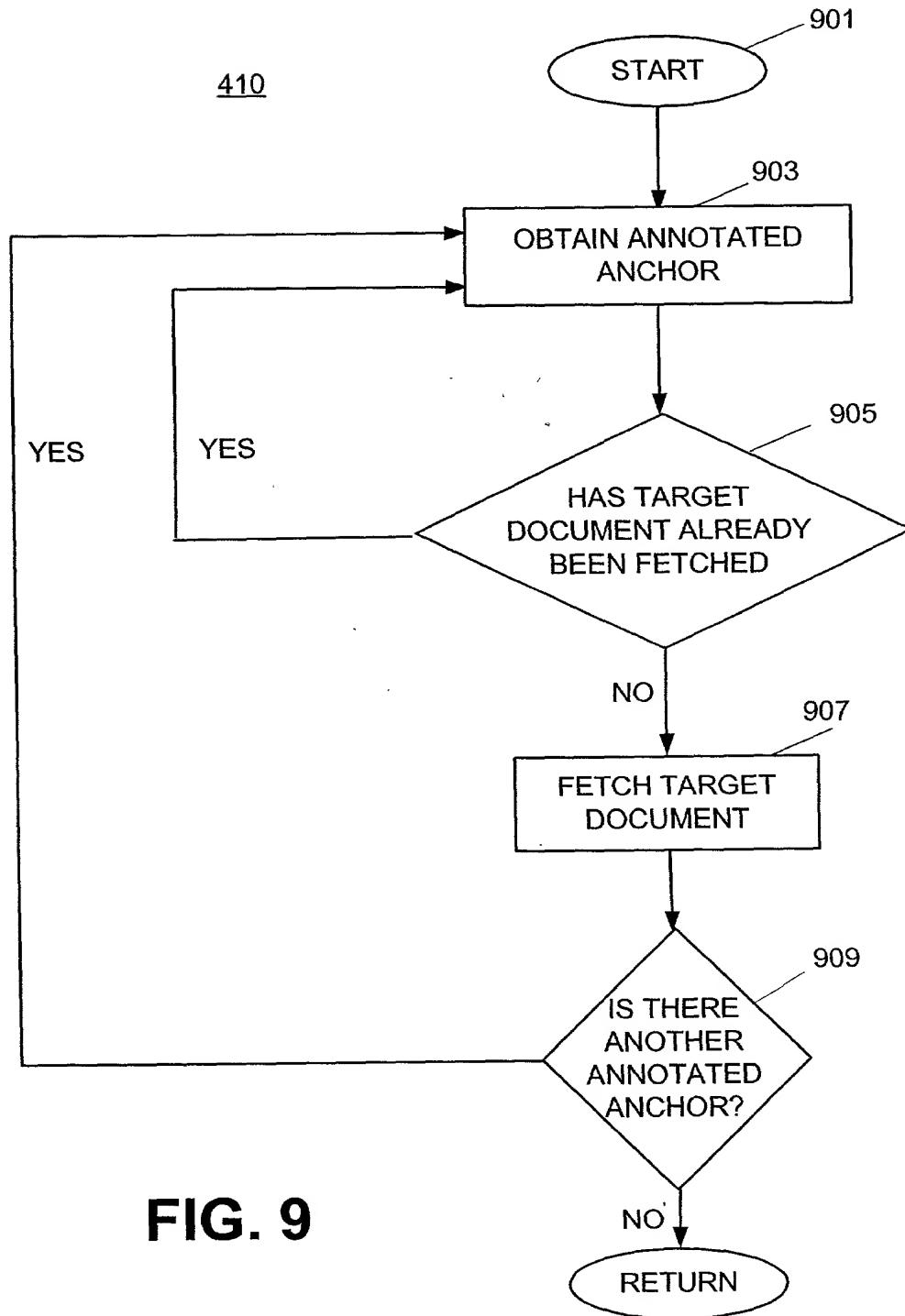


FIG. 9

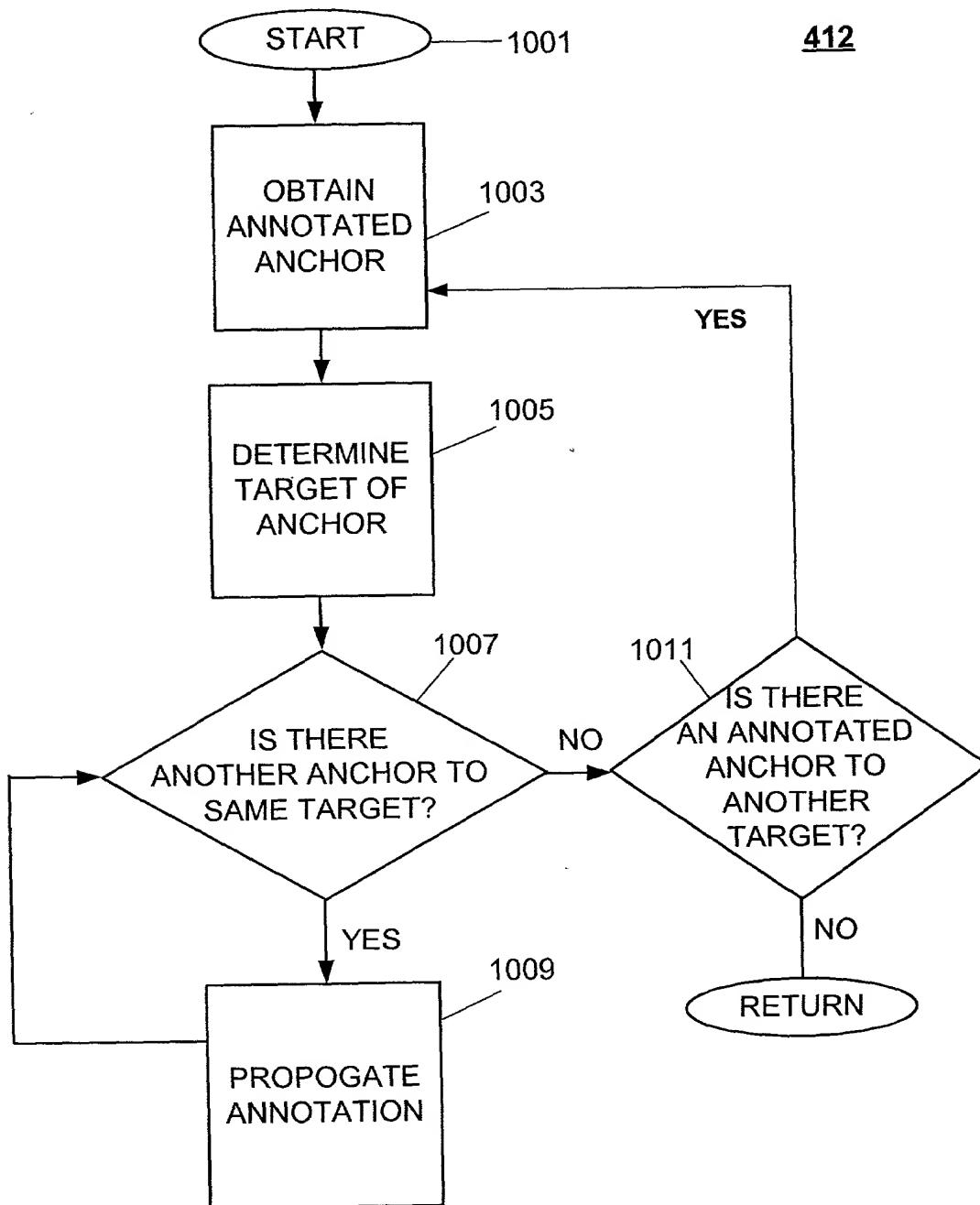


FIG. 10

Title: DETECTION AND PROCESSING OF ANNOTATED ANCHORS
Docket No.: FXPL-01001US0 Applicant(s): Golovchinsky, et al.
Appl. No.: Unknown Attorney: Larry T. Harris
Confirm No: Unknown Phone: (415) 362-3800
Filed: Herewith Express Mail No.: EL622696845US
Sheet 11 of 17

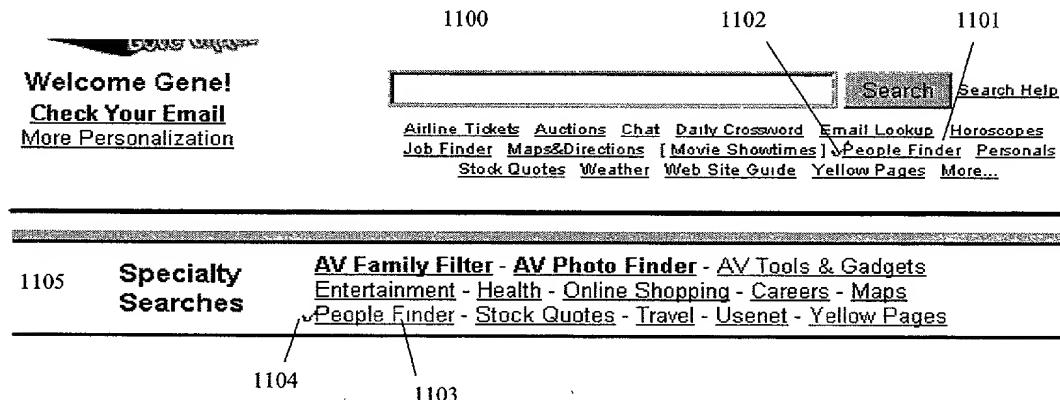


FIG. 11

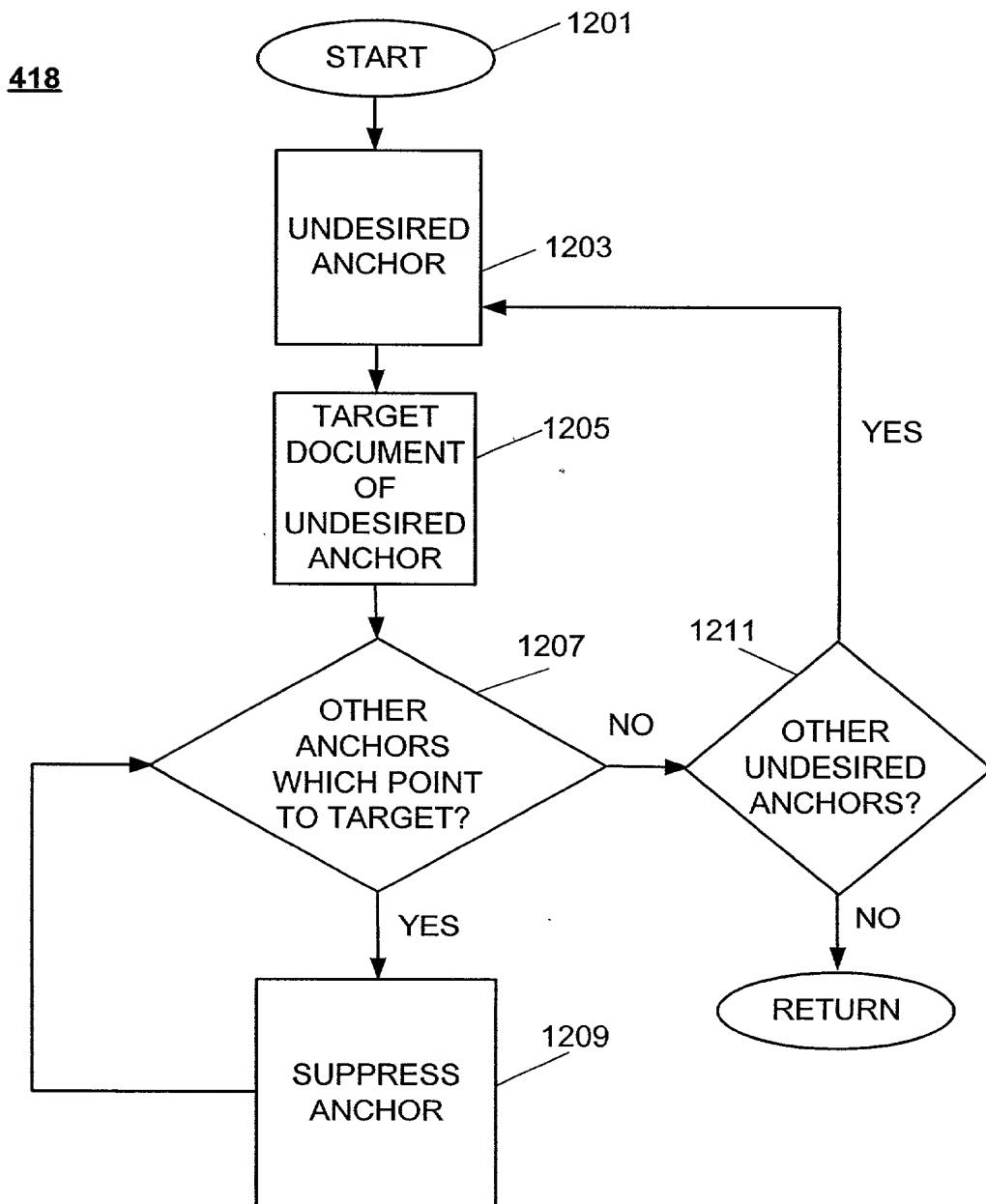


FIG. 12

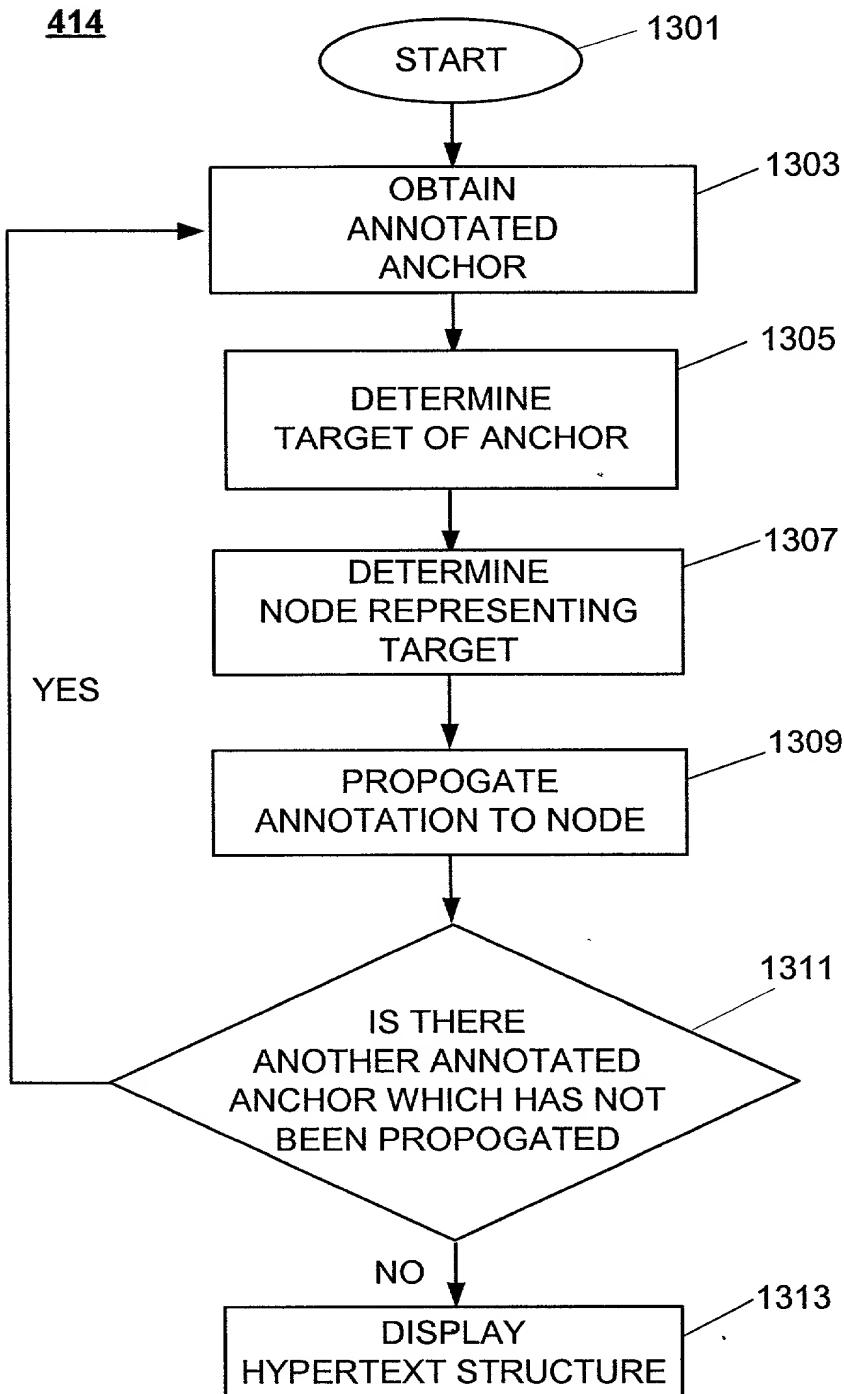


FIG. 13

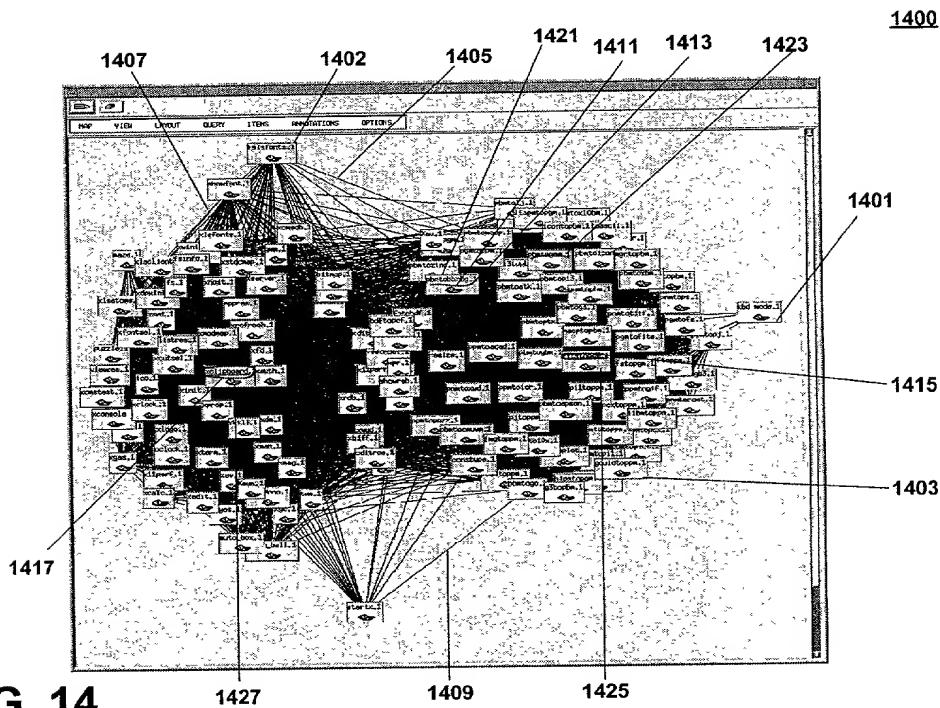
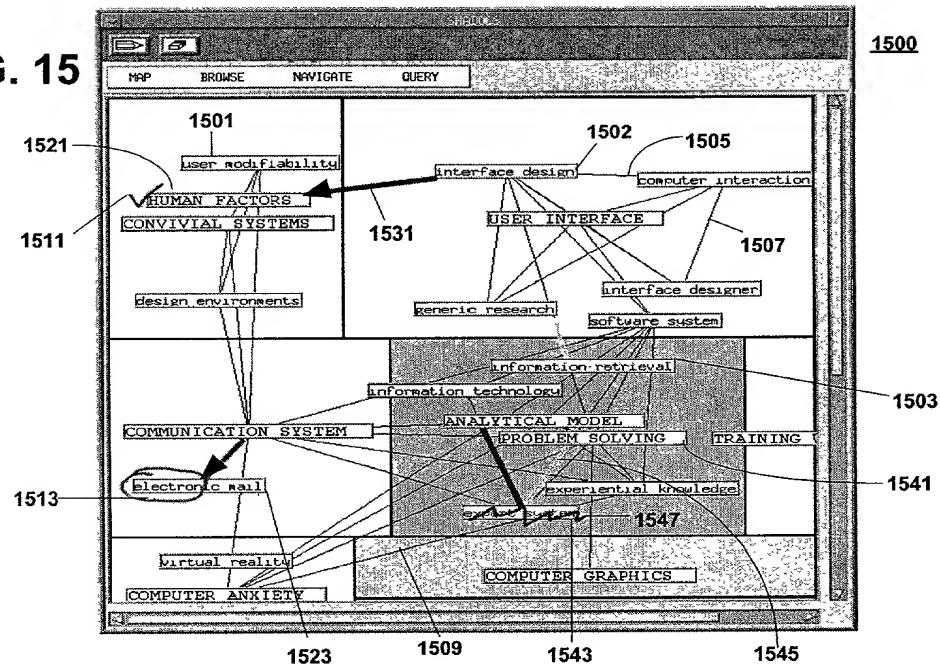


FIG. 14

FIG. 15



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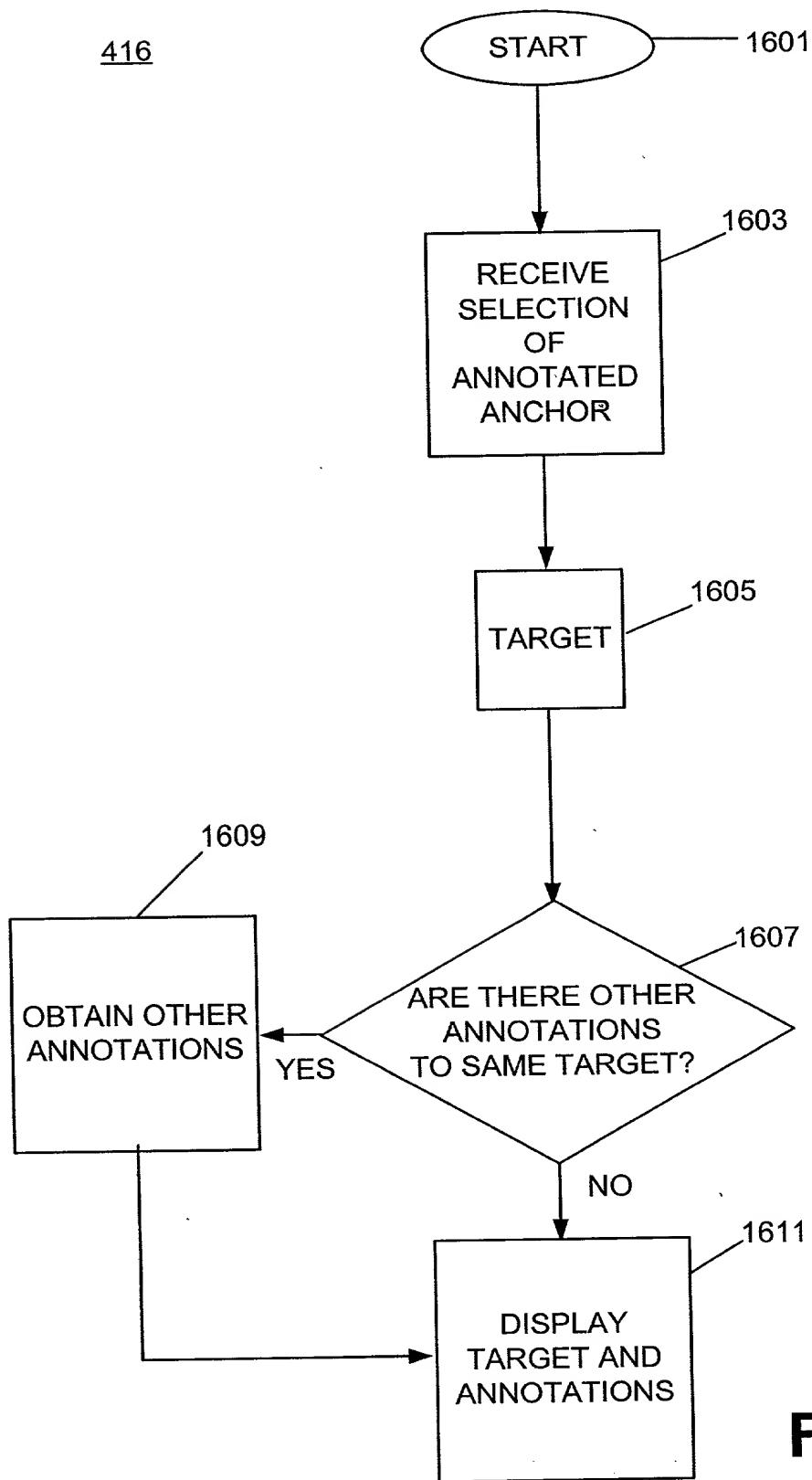


FIG. 16

a shot with irregular lines as an indication of the camera motion detected in the given shot. Falchuk and Karmouch [9] propose the concept of video-tiles in which the key frame of

[9] B. Falchuk and K. Karmouch, "A multimedia news delivery system over an ATM network," in *Int. Conf. Multimedia Computing and Systems*, 1995, pp. 56-63.

The second problem affects the reader more than the author. Very large collections of texts can be expected to contain vast numbers of potentially useful links. Unfortunately, most links would not be useful most of the time, and their sheer number can overwhelm even the most careful user interface design. Thus alternatives to semi-automatic link generation must be found.

1.2 Information retrieval and hypertext

The link creation problems described above suggest that more traditional information retrieval techniques must be used to accommodate large collections of nodes. Information retrieval methods have been applied to hypertext databases in several ways: link information has been used to inform retrieval algorithms (e.g., [8], [14], [19], [13], [36]), term co-location information has been used to suggest links to human authors (e.g., [2], [4], [32]), and queries have been used to retrieve hypertext nodes (e.g., [9], [12], [6], [5]). Relevance feedback has also been used to guide retrieval and to infer links among documents (e.g., [3]). Most systems that use queries as navigational aids use them to identify relevant neighborhoods in the hypertext, and then rely on manually-created links to support further navigation.

IR techniques have been used to segment long articles into shorter, more focused nodes (e.g., [34], [22]). Similarity among passages has been used to create links between specific nodes. This work, however, has focused on text segmentation techniques rather than on the hypertext interface. Although it is clear that such approaches are promising, little evidence has been published to date regarding their integration into interactive hypertext systems and about the effectiveness of such techniques in support of interactive browsing.

SuperBook, one of the more successful query-mediated browsing systems, used keyword queries instead of static hypertext links as a navigation mechanism [31]. Information was presented to the user in several windows, including table of contents (TOC), query, and text viewed. Users could use the TOC hierarchy to arrive at the desired section, or they could type in queries (or select keywords in the text). Search results were used to annotate the TOC to indicate relevant passages. Thus the system achieved hypertext-like browsing by combining TOC-based navigation with full-text search.

SuperBook's reliance on the table of contents to organize the browsing session limits it to providing access to highly-structured documents. Although an extension to SuperBook that works across documents

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has been demonstrated [28], it still relies on hierarchical structure of each document to support local navigation. SuperBook has been shown to be an effective interface for IR tasks when browsing structured collections [12], but alternatives to the book metaphor must be found to support browsing through loosely-structured hypertext collections.

One such alternative — the newspaper metaphor — is discussed in the following section, and VOIR, a prototype that implements it, is described. Some experimental results from an evaluation of VOIR are presented, and the paper concludes with a discussion of possible extensions and applications of this query-mediated hypertext interfaces.

2 VOIR

This section describes VOIR (Visualization of Information Retrieval), a prototype newspaper-based dynamic hypertext interface. The section first introduces the newspaper metaphor and discusses its implementation in VOIR. A description of VOIR's linking interface follows, and the discussion concludes with an overview of VOIR's visualization features.

2.1 The newspaper metaphor

Newspapers such as the Wall Street Journal are designed to present a variety of different, loosely-related articles in a manner that supports browsing and selective reading. The front page of each newspaper section provides an overview of the contents. It presents summaries of articles, with references to other pages where additional details are discussed. The layout of each broadsheet provides cues to the relative importance of articles: important articles are usually placed near the top of the page, and more column space is allocated to them. These layout features serve to alert the reader to potentially useful information, and to structure interaction with a text that does not possess an overall narrative.¹

These features of a newspaper make it an appropriate vehicle for displaying hypertext information [18]. Users can capitalize on their familiarity with newspapers to browse hypertext collections. In addition to providing similarity-based structure, the newspaper metaphor can support the notion of landmark nodes [29] and hypertext links. The front page of a newspaper serves as a landmark around which semantically-related articles are organized. Articles split among several pages are connected with links. Overviews of contents are quite common. This

¹Each article, of course, has an internal structure. The newspaper merely serves to bind those largely-independent narratives together.